Some Useful Conversions in Relating Historical and Future Catch Statistics of Soft-Shell Clams (*Mya arenaria*) in the Scotia-Fundy Region

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SOME USEFUL CONVERSIONS IN RELATING HISTORICAL AND FUTURE CATCH STATISTICS OF SOFT-SHELL CLAMS (*MYA ARENARIA*) IN THE SCOTIA-FUNDY REGION

by

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ABSTRACT

Hawkins, C.M. and T.W. Rowell. 1984. Some useful conversions in relating historical and future catch statistics of soft-shell clams (*Mya arenaria*) in the Scotia-Fundy Region. Can. Tech. Rep. Fish. Aquat. Sci. 1309: iv + 16 p.

Several conversions relating historical landings and production are presented for volumetric measures, round weights, and meat weights. A conversion factor relating round weight and shucked meat weight, irrespective of season, is provided. Using these factors, past estimates of production can be examined with more ease to provide a better base for interpretation of trends in the harvesting and production of soft-shell clam beds in the Scotia-Fundy Region.

RÉSUMÉ

Hawkins, C.M. and T.W. Rowell. 1984. Some useful conversions in relating historical and future catch statistics of soft-shell clams (*Mya arenaria*) in the Scotia-Fundy Region. Can. Tech. Rep. Fish. Aquat. Sci. 1309: iv + 16 p.

Le rapport qui suit contient plusieurs facteurs de conversion établissant la relation entre les débarquements historiques et la production à partir de mesures volumétriques, de poids rond et de poids de chairs. On y donne un facteur de conversion entre poids rond et poids des chairs sans la coquille, quelle que soit la saison. Grâce à ces facteurs, on peut étudier plus facilement les estimations de production passées et baser plus solidement l'interprétation des tendances dans la récolte et la production des bancs de myes de la Région Scotia-Fundy.

INTRODUCTION

The soft-shell clam, Mya arenaria is an important fisheries resource in the Scotia Fundy Region. The Scotia-Fundy Region includes all of the Bay of Fundy and the outer coast of Nova Scotia from the Bay of Fundy to Cape North in Cape Breton Island. It has been commercially harvested from at least the turn of the century, and catch records have been maintained since about 1918. Commercial landings have fluctuated markedly over the years, primarily in response to fishing effort and market value; but in the past 10 yr, landings (round weight) have ranged from a low of 1,128 t in 1976 to a high of 3,309 t in 1982[1] (Fig. 1). During this same period the average landed dollar value per kilogram more than doubled: $0.31-$0.76 in Nova Scotia and $0.31-$0.69 in New Brunswick. In 1983 the commercial catch (landed value) in the Scotia Fundy Region approached $2.5 million.

Since the inception of the commercial fishery there have been several units employed to describe both landings and quantities of processed or shucked meats, e.g. barrels, bushels, hods, among others, for quantifying whole or round weight and U.S. gallons to represent fresh or shucked meat weight. Since the advent of metrification, the majority of catches are being sold to buyers on a strictly weight basis; it therefore appears appropriate to establish a simple means of comparing historical units of production with those of present trends in the fishery.

This report summarizes the units of measure in which catch has been described quantitatively throughout the history of the fishery. In addition, a general conversion factor relating live weight to shucked meat weight yield is given. This conversion factor has the advantage of being independent of seasonal changes in meat yield and will provide industry as well as scientific researchers with a rapid means to establish meat yields (production) directly from reported landings.

Throughout the time period for which this report covers (1940 to 1983), there has been no enforced size limit for the harvesting and marketing of soft-shell clams in the Region. However, buyers for processing plants prefer to purchase clams of at least 30 mm in length to satisfy their product markets.

MATERIALS AND METHODS

Much of the historical data and information was derived from Manuscript and Technical Reports of the Department of Fisheries and Oceans and its predecessors. Most of the written

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[1]Statistics Division, Management Services Branch, Department of Fisheries and Oceans, Scotia-Fundy Region, Halifax, N.S.

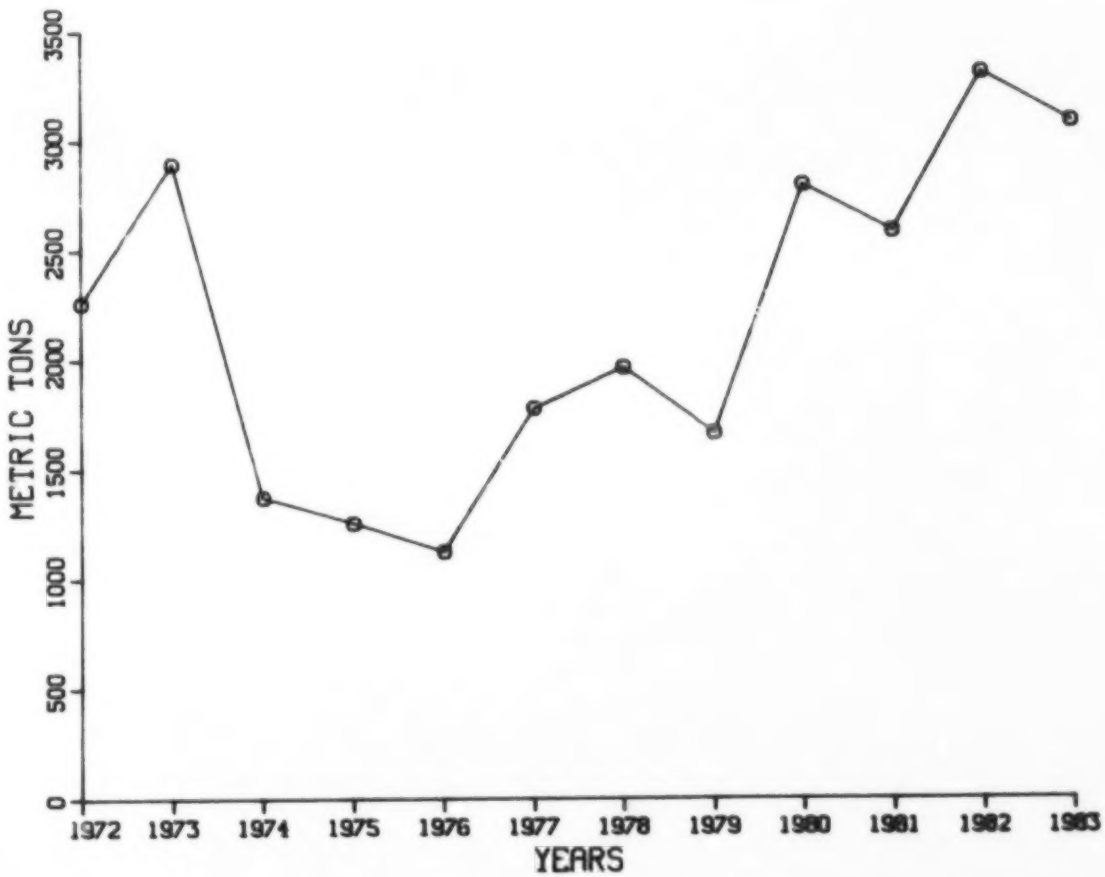

Figure 1. Soft-shell clam landings for the Scotia-Fundy Region, 1972-1983. Values are expressed in metric tons round weight.

work spans the early period of intense research on clams in the Maritimes from 1940 to 1967 (Dickie 1955; MacPhail 1963; 1964a; 1964b; Medcof 1949; 1950; 1952; 1967). These early works contained data from commercial fish plants which were essential in developing the conversion factors discussed below. More recent studies directed toward assessing the distribution and abundance of stocks for management purposes (Robert 1979; 1981; Robert and Smith 1980; Witherspoon 1982; 1983; among others) have relied heavily on the early expressions for describing volumes of clams landed or estimated as biomass.

During the initial data analysis it was evident that various authors presented different quantitative values for the same unit of measure. To avoid confusion among these different equivalents, our study selected the most frequently and recently cited value as representative of the unit of measure in question. (Specific examples are discussed as they appear in the "Results" section.) Generally, whether we dealt with whole (round) volume or shucked meats, values were equated to litres to aid in converting to other measures. Unless otherwise stipulated, all values are imperial measures.

RESULTS/DISCUSSION

This section is divided into two parts: one which deals with round shellstock volumes, and the other which deals with fresh shucked meat weight and round fresh weight of shellstock. Each unit measure is given as it is originally cited in the literature, and its relationships to other measures are shown in Table 1.

PART I: VOLUMETRIC EQUIVALENTS

The bushel, peck, and quart are imperial units which have been commonly used to quantify volumes of whole shellstock or shucked meats. These units may be easily converted to the International System of Units (SI) (Anderton and Bigg 1972), and their relationships to other measures of clam abundance are shown in Table 1. Other measures for describing clam abundance include the barrel, hod, and pail or bucket. These are discussed below.

Barrel

The barrel was one of the largest units of volume used in the early period of the commercial clam fishery and in the early assessments of clam abundance on specific clam flats. Clam research programs developed in the early 1940's in Nova Scotia and New Brunswick and reported on by Dickie (1955) and Medcof (1949; 1950) cite that one barrel of whole shellstock of

Table 1. Table of volume equivalents calculated for several measures used to quantify soft-shell clam harvest.

Measure \ Equivalent	Barrel	Bushel	Hod	Peck	Pail/Bucket	Gallon	Quart	Litre
Barrel	1.000	2.500	5.000	10.000	13.290	19.980	79.76	90.93
Bushel	0.400	1.000	2.000	4.000	5.320	7.990	31.90	36.37
Hod	0.200	0.500	1.000	2.000	2.660	4.000	15.96	18.19
Peck	0.100	0.250	0.500	1.000	1.330	2.000	7.97	9.09
Pail/Bucket	0.075	0.180	0.376	0.752	1.000	1.500	6.00	6.84
Gallon	0.050	0.125	0.250	0.500	0.667	1.000	3.99	4.55
Quart	0.013	0.031	0.063	0.126	0.167	0.250	1.00	1.14
Litre	0.011	0.028	0.055	0.110	0.146	0.220	0.88	1.00

harvest-size clams is equivalent to 2.5 imperial bushels. The relationships between a barrel and other units of measure are shown in Table 1.

Hod

The hod is also a term which has been used in the early assessment of clam production and abundance. Medcof (1952) cites 1 hod as being equivalent to 0.5 bushels or 2 pecks (Table 1).

Pail or Bucket

The pail or bucket was often used by fisherman in assessing their catch. It was also adopted in the early scientific literature as a way to describe production on a clam flat in terms more suitable to the understanding of the fisherman.

Medcof and MacPhail (1951) indicate that in the fishery of the time (1945) 1 pail or bucket was about 1.5 pecks. However, McLeod and Hill (1973) indicate that there are 5.32 pails in 1 bushel; thus, on the basis of 4 pecks to a bushel, we calculate that 1.33 pecks are equivalent to 1 pail volume. Since Medcof's and MacPhail's value was considered approximate, we have selected the latter equivalence for use in Table 1. In addition, MacPhail (1964a; 1964b), Medcof (1967), and others indicate that there are 6 quarts in 1 pail.

Gallons, Quarts, and Litres

Although we found no historical reference in which gallons were used to describe shellstock volume or abundance, we have, for completeness, provided equivalents in Table 1. These equivalents were established on the basis of an imperial measure conversion table presented in Anderton and Bigg (1972).

The term "quart" is discussed above in reference to the pail.

For metric relationships all values shown in Table 1 have been expressed in terms of litres according to equivalents from Anderton and Bigg (1972).

PART II: WEIGHT EQUIVALENTS

Although we recognize that many factors affect the round as well as fresh meat weight of clams over the course of 1 yr, an attempt was made to determine a general conversion factor which could be used to estimate meat yield from fresh round weight. To quantify this factor we examined historical records covering

all seasons in the period 1944 to 1949. These records contained catch and production reports from processing plants in the Scotia-Fundy Region. Since each reported value varied in the way meat yield was expressed, the value was adjusted to an equivalent term for comparative purposes.

Although the data are historical, there is some evidence to suggest that the average meat yield for clams from this area has not changed significantly with time. Unpublished meat yield data from clams collected in June 1984 differ by 3% or less from mean values for meat yield determined over the month of June for the years 1944-1949 (Medcof 1949; Thurber 1949). Their validity is further supported by the relative constancy of meat yield over the period examined (see Table 2).

The most quoted figure for shucked meat weight is: "1 U.S. gallon contains 8 pounds of drained meats carefully weighed" (Medcof 1949; Thurber 1949). This conversion value, combined with the monthly averages of meat yield expressed in pounds per 0.5 bushel of whole (round) clams from several clam processing plants in Nova Scotia, was used as the basis for all comparisons shown in Table 2. This table indicates that an overall average mean monthly meat yield of shucked clams per barrel is relatively constant at 31.78±3.48 lb, even though the data span 5 yr and all fishing seasons. Consequently, this latter value was used throughout to calculate equivalent meat yields for eight expressions of harvest shown in Table 3.

The same approach was followed in calculating the round weight of market clams for several volumetric measures of harvest. Initial examination of the historical records indicated an elevated value for the weight of market clams in 1 bushel. Two reports, one involving data in New Brunswick for the period from 1959-1962 (MacPhail 1964) and the other involving more recent data (1972-1973) in Nova Scotia (MacLeod and Hill 1973), state that one bushel represented 80 lb of fresh shellstock. A more recent and more widely quoted value throughout the Maritimes equates 1 bushel of harvest-size clams (>30 mm shell length) to be 60 lb (27.27 kg) of shellstock (Rowell et al. 1976; Robert 1979; 1981; Robert and Smith 1980; Witherspoon 1982; 1983). Recent communications with Fisheries Officers in Nova Scotia suggest that the weight of market clams in a bushel is likely to be closer to the latter value of 60 lb. This latter value was subsequently used to generate the appropriate equivalents given in Table 3. Further examination of Table 3 indicated a constant relationship between round weight and meat weight; meat weight equalling 21% of round weight. This calculated value compares well to the 20% suggested by MacLeod and Hill (1973).

Table 2. Mean meat yields per barrel of shellstock calculated from records of shellfish processing plants operating in Nova Scotia, 1944 to 1949.

Mean weight in lb per barrel of shellstock	Standard Deviation	N.	Period	Location	Source	Note
36.56	1.68	7	April-Oct. 1944	International Shellfish Shucking Plant, Digby, N.S.	Medcof 1949	1
29.00	-	1	April-Dec. 1944	Soffron Brothers, Digby, N.S.	Medcof 1949	2
30.20	3.45	45	March-Dec. 1944-1949	General Seafoods, Halifax Co., N.S.	Thurber 1949	3
34.32	1.36	8	March-Oct. 1946	International Shellfish Shucking Plant, Digby, N.S.	Thurber 1949	4
28.81	2.20	8	March-Oct. 1946	General Seafoods, Halifax Co., N.S.	Thurber 1949	5
Avg: 31.78	3.48	5	April-Dec. 1944-1949	Nova Scotia		

Notes:

1 - Calculated from Medcof 1949, Table 12, using 1 U.S. gallon = 8.0 lb.

2 - From Medcof 1949, Table 13, 1 bbl equals 29 lb meat.

3 - Calculated from Thurber 1949, Table 32, where monthly mean yields in pounds per 0.5 bushel were converted to equivalent weights per barrel, 2.5 bushels = 1 barrel.

4 - Calculated from Thurber 1949, Table 34, average monthly meat yield in U.S. gallons per barrel of shellstock, 1 U.S. gallon = 8.0 lb.

5 - From Thurber 1949, Table 34, mean monthly meat yield in pounds per 0.5 bushel converted to pounds per barrel by factor of 2.5 bushels equal 1 barrel.

Table 3. Conversions[1] of whole shellstock weight to meat yield weight for several units of harvest.

Unit of harvest	Imperial measure (lb)		Metric measure (kg)	
	Round weight	Meat yield	Round weight	Meat yield
Barrel	150.18	31.78[2]	68.18	14.43
Bushel	60.07	12.71	27.27	4.77
Hod	30.04	6.36	13.64	2.89
Peck	15.02	3.18	6.82	1.14
Pail/Bucket	11.30	2.39	5.13	1.09
Gallon	7.82	1.59	3.55	0.72
Quart	1.87	0.40	0.85	0.18
Litre	1.65	0.35	0.75	0.16

1- General conversion factor 0.21
- i.e.: (lb round weight) (0.21) = x lb meat yield
(kg round weight) (0.21) = x kg meat yield

2- Calculated from Table 2.

SUMMARY

1. A table of volumetric conversions relating several historical and present units of quantifying shellstock is presented.

2. Based on historical data from clam processing plants an estimate of the weight of commercial clam meats per unit volume, irrespective of season, is determined.

3. A table relating round weight of market shellstock and equivalent shucked meat weight is presented. From this, a conversion factor of 0.21 was determined for converting round weight to shucked meat yield irrespective of season.

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